

## **Title: Flat Stanley Explores Washington, DC**

### **Brief Overview:**

In order to understand perimeter and area, students should have prior knowledge of polygons and addition as specified in NCTM content Standards. This unit uses a Washington, DC monuments theme to introduce estimating and determining perimeter and area through whole numbers. (Note: Flat Stanley Project. Used with permission.)

### **NCTM Content Standard/National Science Education Standard:**

1. Use visualization, spatial reasoning, and geometric modeling to solve problems.
  - Use geometric models to solve problems in other areas of mathematics, such as number and measurement.
2. Understand measurable attributes of objects and the units, systems, and processes of measurement.
  - Understand such attributes as length, area, weight, volume, and size of angles and select the appropriate type of unit for measuring each attribute.
3. Apply appropriate techniques, tools and formulas to determine measurements.
  - Develop, understand, and use formulas to find the area of rectangles and related triangles and parallelograms.

### **Grade/Level:**

Grades 3 – 4

### **Duration/Length:**

3 – 4 days (60 minutes per day), 1 day will be used for assessment.

### **Student Outcomes:**

Students will:

- Apply measurement concepts to determine the perimeter and area of polygons.
- Estimate and determine the perimeter of geometric figures on a grid.
- Estimate and determine the areas of figures in square units.

### **Materials and Resources:**

#### **Lesson 1**

- Geo boards (1 per student)

- Overhead projector and screen
- Teacher Resource 1, Grid paper transparency
- Student Resource 1, Grid paper (2 per student)
- Overhead markers
- Rulers
- Tape measures
- 3 x 5 index cards (3 per groups of 4 students)
- Student Resource 2, perimeter worksheet (1 per student)
- Teacher Resource 2, perimeter worksheet answers
- Toothpicks (25 per student)
- Chalk

## Lesson 2

- Student Resource 6 K-W-L Chart
- Teacher Resource 7 K-W-L Chart (Transparency)
- Student Resource 7 “Matching Figures”
- Teacher Resource 8 “Matching Figures” Transparency
- Teacher Resource 5 Answer Key
- Teacher Resource 3 “Calculate the Area” Transparency and Answer Key
- Student Resource 3, “Calculate the Area”
- Student Resource 4, “What is the Area of Each Figure?”
- Teacher Resource 4 Transparency and Answer Sheet
- Student Resource 8, “Measure Up”
- Teacher Resource 9, “Measure Up”
- Teacher Resource 6, “Summative Assessment”
- Student Resource 5, “Summative Assessment”
- [ali.apple.com/ali\\_sites/deli/exhibits/1000120/Resources.html](http://ali.apple.com/ali_sites/deli/exhibits/1000120/Resources.html)
- [www.mathgoodies.com/lessons/vol1/challenge\\_vol1.html](http://www.mathgoodies.com/lessons/vol1/challenge_vol1.html)
- Crayons
- Journals
- Snap cubes
- Geo Board
- Ruler

## Development/Procedures:

### Lesson 1

#### Pre-Assessment

Informally record and evaluate students’ ability to measure the perimeter of polygons. Tell students that they will calculate the perimeter of different polygons.

Draw different polygons on the board. Say: *What are these polygons called?* Have students copy and record their answers in their math journals. Next, ask

students how they could measure the polygons. Teacher circulates observing answers.

### **Launch**

- Tell students that today they will be learning about calculating the perimeter of polygons. Say: The perimeter is the distance around a figure.
- Ask for a student volunteer. Tell the student to walk around a desk.
- Ask for another volunteer. Have that student walk around a trapezoid table or another piece of furniture.
- Ask for another volunteer. Have that student trace around the sides of a bulletin board with a yardstick. Have volunteer trace around the outside of the math textbook..
- Tell students that we are going to find the perimeter of these objects by measuring the length and the width and then adding all of the sides of these polygons.
- Distribute rulers and tape measures.
- Tell student groups to measure the items including the desk, table, bulletin board, and textbook and then add the sides of each item. Explain that this is the perimeter.

### **Teacher Facilitation**

- Distribute geo boards to students.
- Display geo board on the overhead.
- Make a square unit on the geo board with all sides equaling 2 inches. Say:  $2 + 2 + 2 + 2 = 8$ , which is the perimeter.
- Model using rubber bands to show different polygons and calculate the perimeter.
- Distribute Student Resource 1, grid paper.
- Display Teacher Resource 1, grid transparency.
- Model and have students draw an equilateral triangle on grid paper. Say: *The length of each side is 3 inches.* Model calculating the perimeter. (9 inches)
- Tell students to draw a rectangle with a length of 4 inches and a width of 2 inches. Say: *How do we find the perimeter of this rectangle?* (We add the sides together.) Give wait time for responses. Tell students to calculate the perimeter. ( $4 + 4 + 2 + 2 = 12$ )
- Tell students to draw a parallelogram with a length of 5 inches and a width of 3 inches. Tell them to calculate the perimeter. (16 inches)

### **Student Application**

- Place students in teams. Tell teams to find the perimeter of various objects in the room where the teacher has already labeled all the measurements of each side on 3 x 5 index cards. Doors, file cabinets,

computer monitors, cylinder blocks, bookshelves, storage units, windows may be used.

- Distribute Student Resource 1, grid paper.
- Tell students to draw squares of 5 units, 11 units and 15 units.
- Tell students to calculate the perimeter. (20 units, 44 units, 60 units)

### **Embedded Assessment**

- Monitor and observe students calculating perimeter. Share with students that you will conduct an informal assessment as they make their calculations.
- Distribute Student Resource 2, Perimeter Worksheet. Have students complete worksheet. Answers found on Teacher Resource 2, Perimeter Worksheet Answers.
- Tell students to write the definition of perimeter in their math journals in their own words with an example.

### **Reteaching/Extension**

#### **Reteaching**

Have students make triangles and rectangles with toothpicks, with each toothpick equaling 1 unit. Challenge students to make figures with 1 toothpick per side, 2 toothpicks per side and 3 toothpicks per side. Have students count the sides on each figure to calculate perimeter. Have students describe the process of calculating perimeter orally. Partner stronger students with weaker students.

#### **Extension**

- Have student teams estimate, and then measure the perimeter of construction paper, a poster, Social Studies book, and television screen. The team with the closest estimate wins an incentive.

### **Lesson 2**

#### **Pre-Assessment – What Do You Know?**

- Distribute Student Resource 6, “K-W-L Chart.” (adapted from the 2006 institute folder)
- Display the Teacher Resource 7, K-W-L Transparency on the overhead. (adapted from the 2006 institute folder)
- Distribute crayons
- Have the students complete Student Resource 6, “K-W-L Chart.” After the students complete the chart discuss the responses with the students.
- Distribute Student Resource 7, “ Matching Figures”

- Say:” You are going to circle 3 matching figures.” As the class works, you will walk around the room and make observations to assess the strategies the students are using to complete the assignment.
- Ask the class, “How did you determine which shapes are matches?” (The class will give their responses.)

### **Launch-**

- Say: “Today, we will learn how to calculate the area of given figures. Yesterday, you learned that perimeter is the distance around a geometric figure. The definition of area is the inside of the amount covered of a geometric figure. Ask a student to walk the perimeter of the room. Explain that to find the area of the room is to count the tiles that cover the floor in the entire room.
- Direct the students to write the definition of area in their journals.
- Explain “area is measured in squares- square meter, square kilometer, square inches, square units, or square feet. Have the students write this data in their journals.
- Say:” To find the matching figures, you had to find the area of each figure.”
- Ask, “What strategies did you use to find the matching figures?” (give response time)
- Demonstrate number one on the Teacher Resource 4, “Matching Figures” transparency by counting all the units in the figure.
- Ask the students to count aloud as you count the units. Ask the students to give you the area of number one. (18 square units)
- Using the Student Resource 4, “Matching Figures” from the pre-assessment, tell the students to count the inside of each figure. Write the area above the figure.
- Have students color the 3 figures that have the same area.
- Ask the students, “What is the difference between area and perimeter? (Perimeter is the distance around the geometric figure and area is the amount of space the area covers.)
- Distribute the snap cubes.
- Distribute the Geo Boards.
- Distribute Student Resource 5, “Calculate the Area” (Adapted from the 2006 institute folder).
- Using a Geo board, demonstrate how to make one of the figures on the Teacher Resource 3, transparency (adapted from the 2006 institute folder).
- Have the students make the figures on their geo board and write the area on the sheet.
- Walk around and monitor the students work.. Ask questions to ensure the students know why their answers are correct.
- Using the snap cubes, demonstrate how to make one of the figures on the Teacher Resource 3, transparency.
- Using the snap cubes, have the students make two figures from the Student Resource 3, “Calculate Area”.

- Ask: “Is the area the same for grid paper, Geo Board, and snap cubes?” (Yes)
- Ask: “If you change the number of cubes on a figure, will it change the area of the figure?” (Yes, because the area inside the figure will be more or less.)

### **Teacher Facilitation**

- Ask: “Why is it important for you to be able to determine the area of a given space?” (Because area measures the amount of space that the figure covers, not just the outer lines.)
- Distribute Student Resource 4
- Say: ” So far we have only measured area using cubic units. Now we are going to measure area using a formula. You will write on the overhead  $\text{Area} = \text{Length} \times \text{Width}$ .
- Ask the students to write the formula in their journals.
- Display Teacher Resource 4.
- Demonstrate the formula for finding the area on the Teacher Resource 4 using number one as the sample problem.
- Ask the students: “How do you know the area for number one is 10 cm?” (Because  $0 \times 1 = 10$ )
- Tell the students to complete the sheet.
- Ask the students” how do you know your answer is correct?” as you monitor the students.
- Explain to the students that counting the units on a grid or using the formula to calculate the area will measure the area of a closed figure.

### **Student Application**

- Say:” Using the snap blocks from the previous activity, you will create figures to illustrate a scenario.
- The scenario is Jabara’s sister wanted a poster for her birthday. The poster has an area of 24 square units. What are the possible shapes of her poster? (1x24, 2x12, 3x8, and 4x6)
- Distribute a ruler and Student Resource 8, “Measure Up.”
- Using the Teacher Resource 9, “Measure Up” models a square with the area of 6cm by 4 cm.
- Have the students draw the measurements from the Student Resource 8, “Measure Up.”
- Say: “Have your partner check your measurements to ensure accuracy.”

### **Embedded Assessment**

- While students are working on both activities, observe how the students are processing the information. Discuss with the students during their independent work any concerns you may have. Ask questions to ensure

the students fully understand the concept of area. The criteria for evaluation is as follows:

- 0- Student's understanding is completely incorrect
- 1- Student shows minimal or partial understanding
- 2- Student shows complete understanding

### **Reteaching**

- If the student does not know how to multiply, allow him/her to use a times tables chart. For the students that have not grasped the concept of area, explain relationships they have observed about shapes and then allow them to practice measuring the area with a geo board.

### **Extension**

- Students can create letters of the alphabet with a given area.
- Students can visit the following web sites to extend their understanding of area:
  - [ali.apple.com/ali\\_sites/deli/exhibits/1000120/Resources.html](http://ali.apple.com/ali_sites/deli/exhibits/1000120/Resources.html)
  - [www.mathgoodies.com/lessons/vol1/challenge\\_vol1.html](http://www.mathgoodies.com/lessons/vol1/challenge_vol1.html)

### **Summative Assessment**

Students will demonstrate an understanding of estimating and determining perimeter and area of polygons by being able to complete selected response and brief constructed response items. The assessment, Student Resource 5, will utilize all of the measurement of perimeter and area skills that have been taught to this point. An answer key can be found on Teacher Resource 6.

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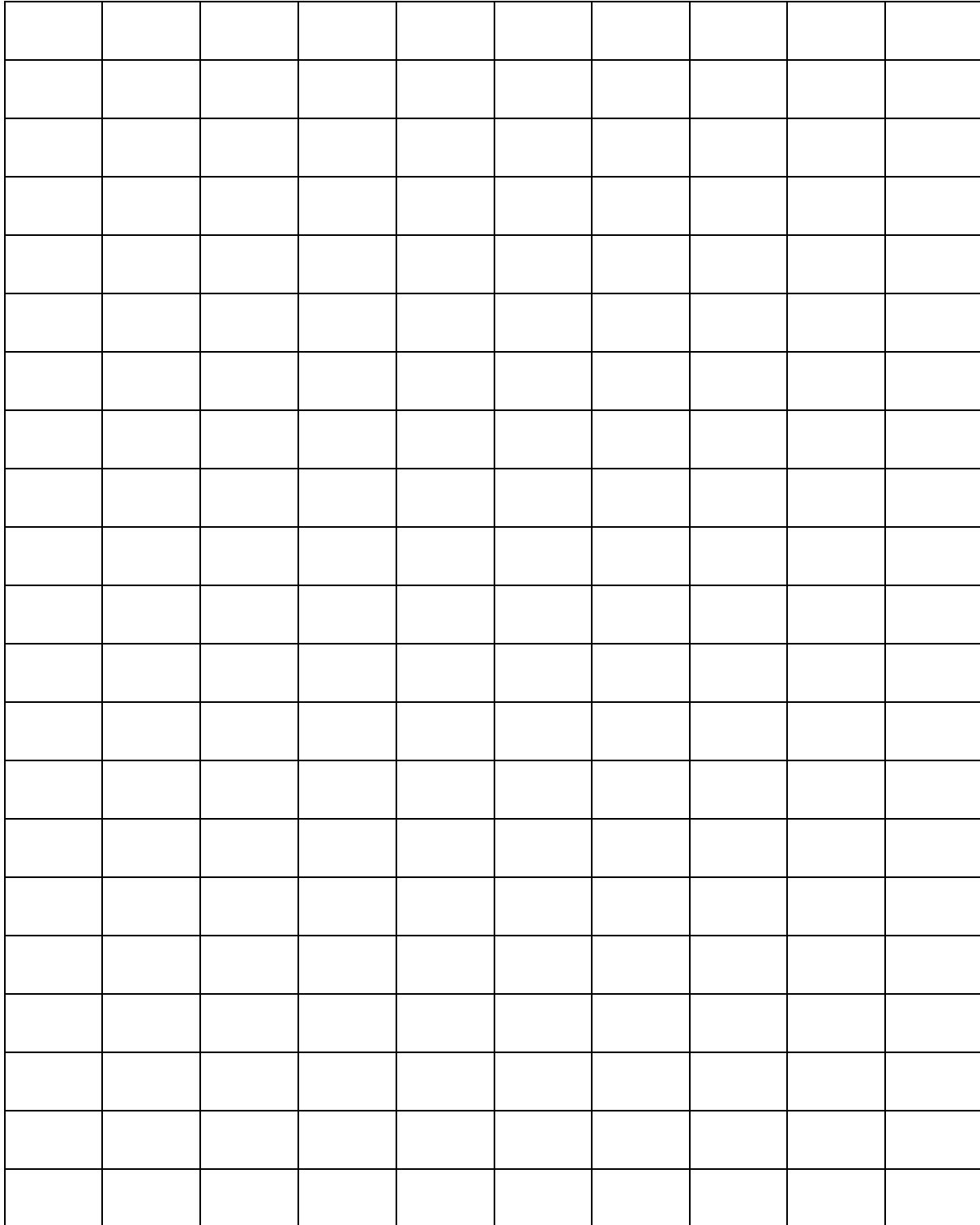
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## Teacher Resources

Teacher Resource 1



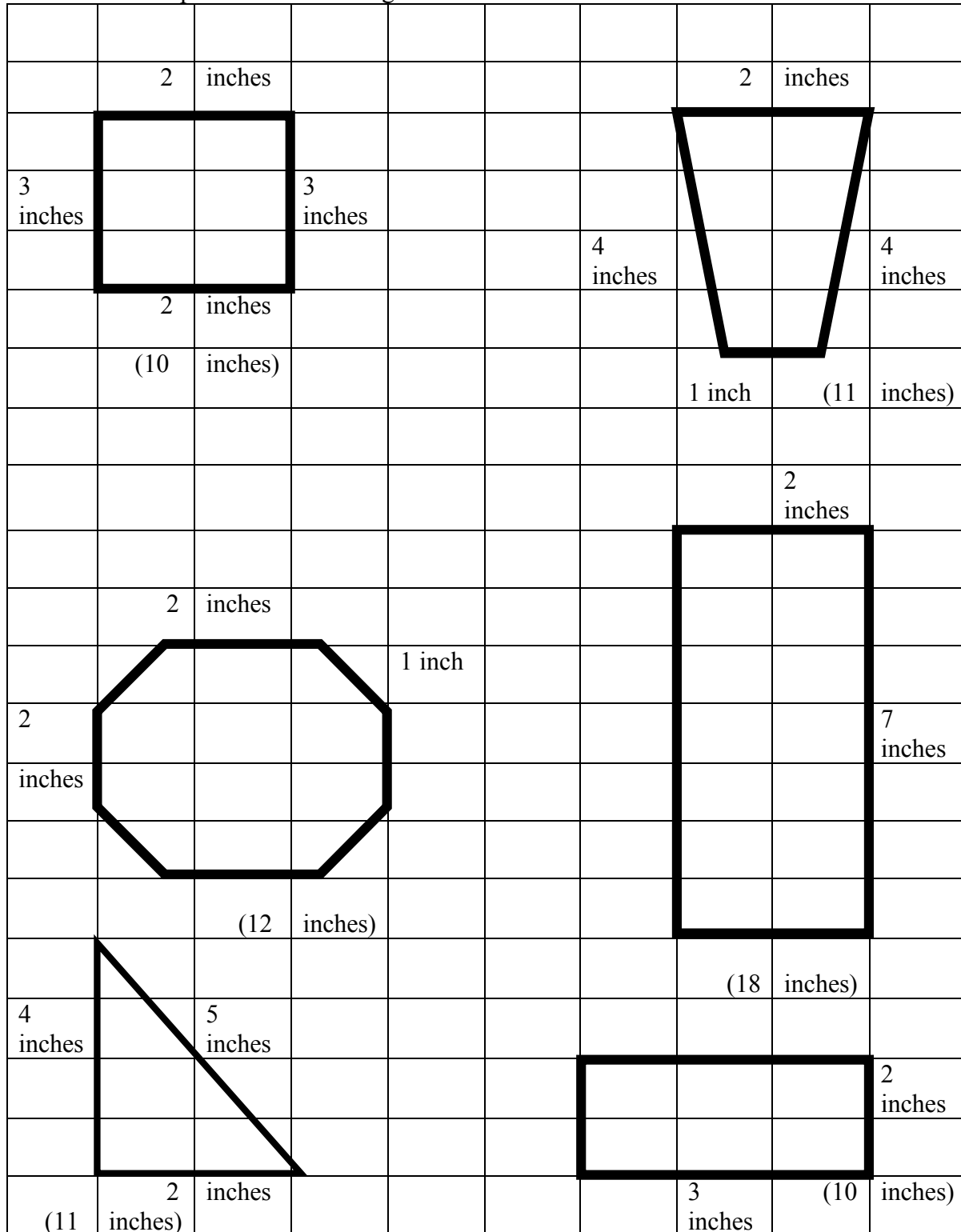
## Grid Paper Transparency





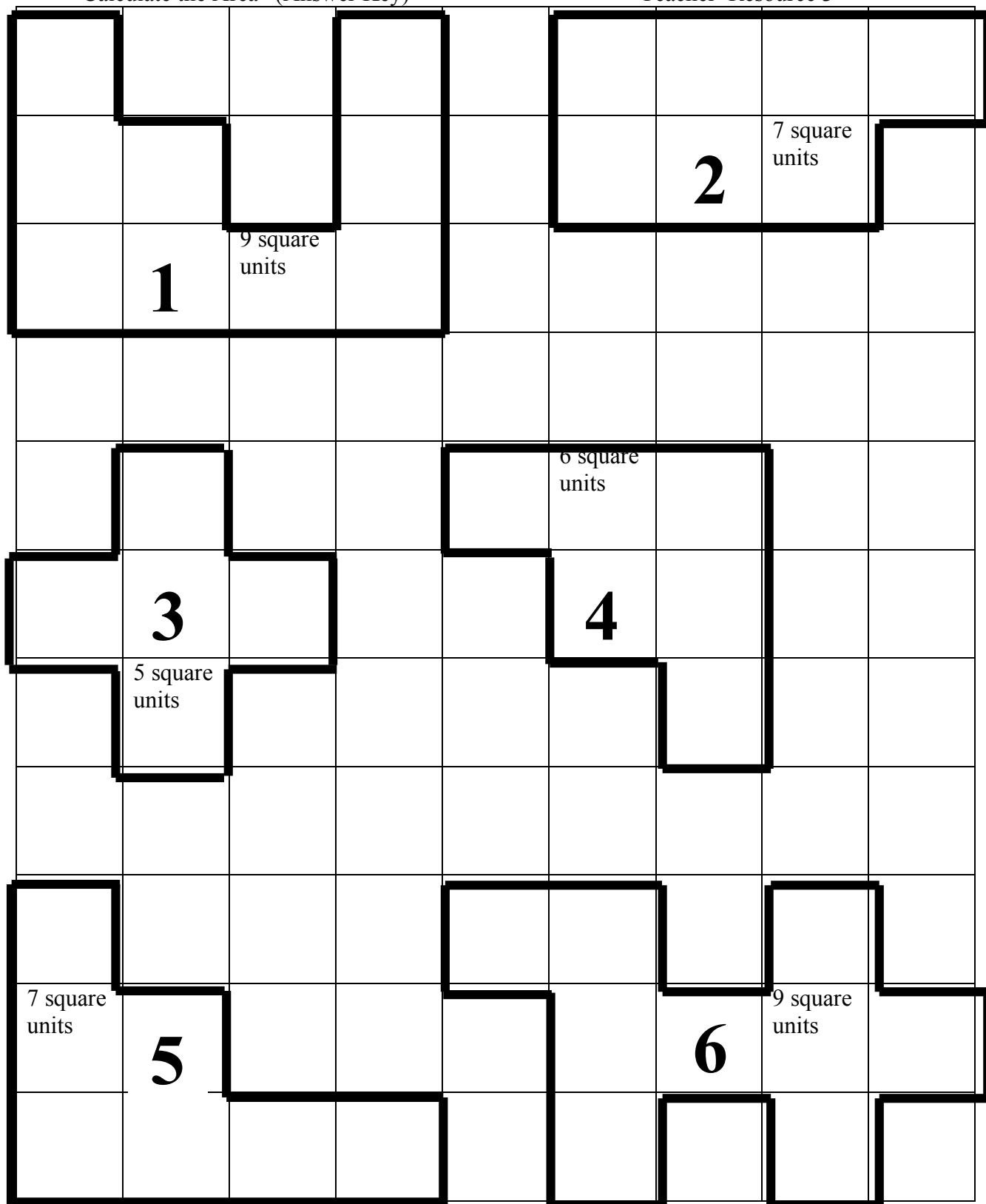
Teacher Resource 2  
Perimeter Worksheet Answers

Calculate the perimeter of each figure.



“Calculate the Area” (Answer Key)

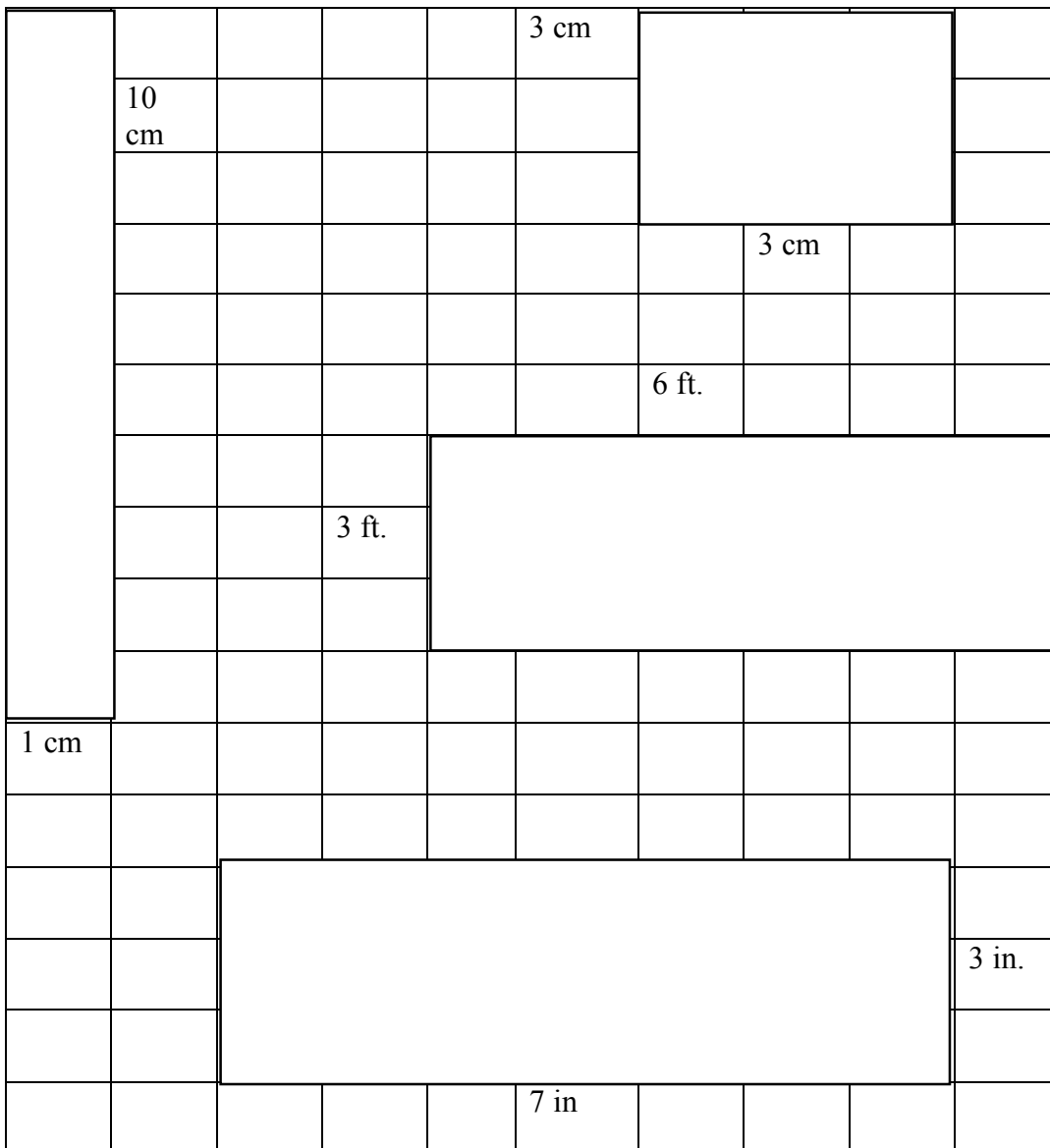
Teacher Resource 3



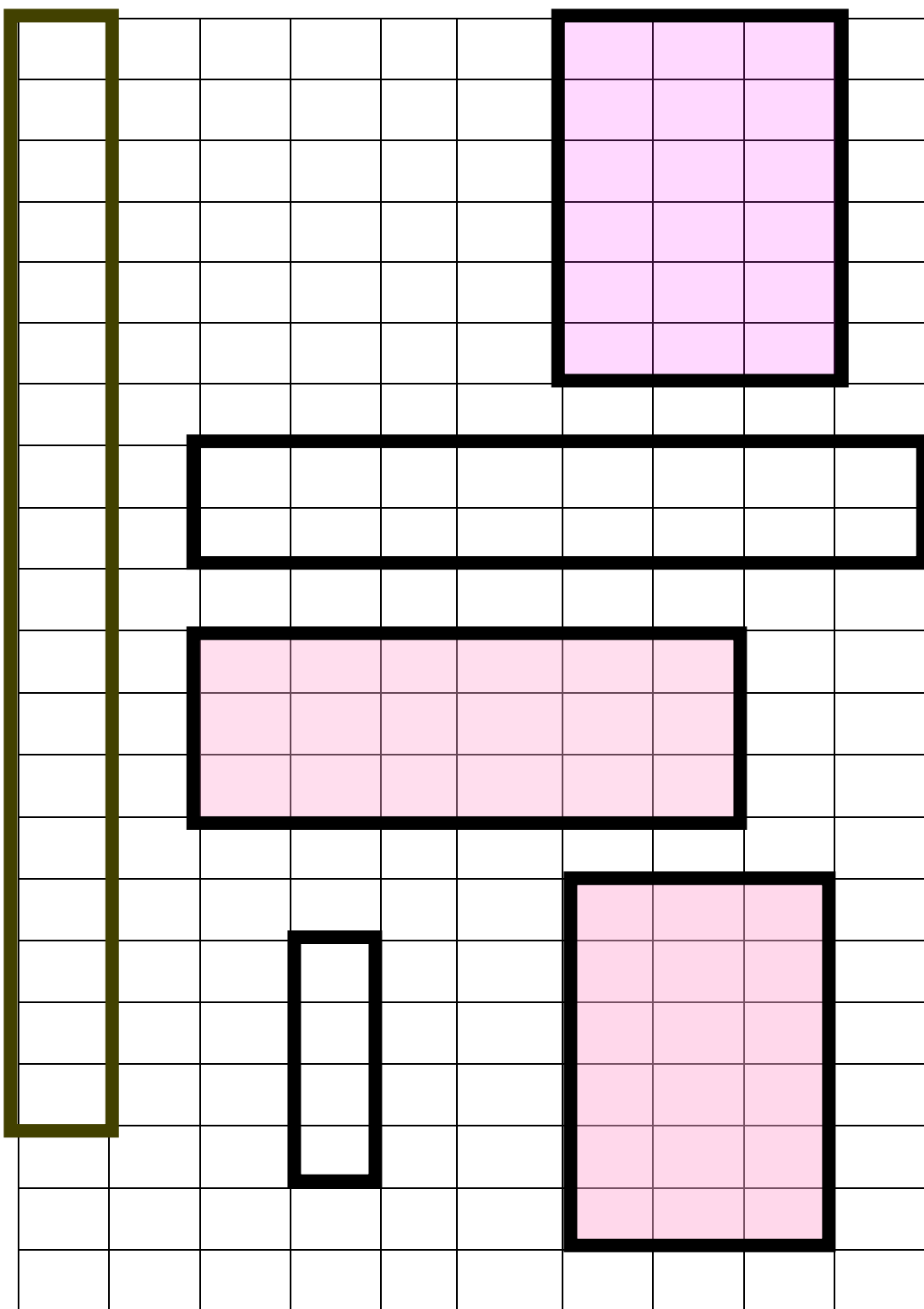
# Teacher Resource 4



What is the area of each figure?



## Teacher Resource 5

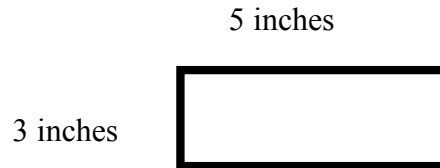




**Summative Assessment**

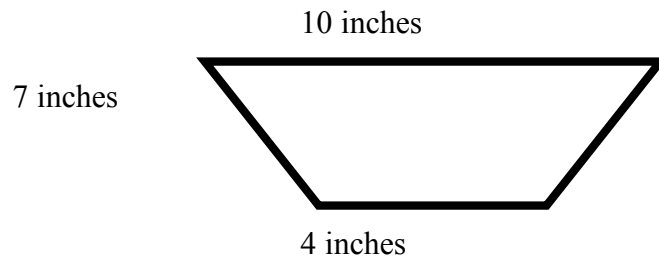
Choose the correct response.

1. Find the perimeter of the following polygons.



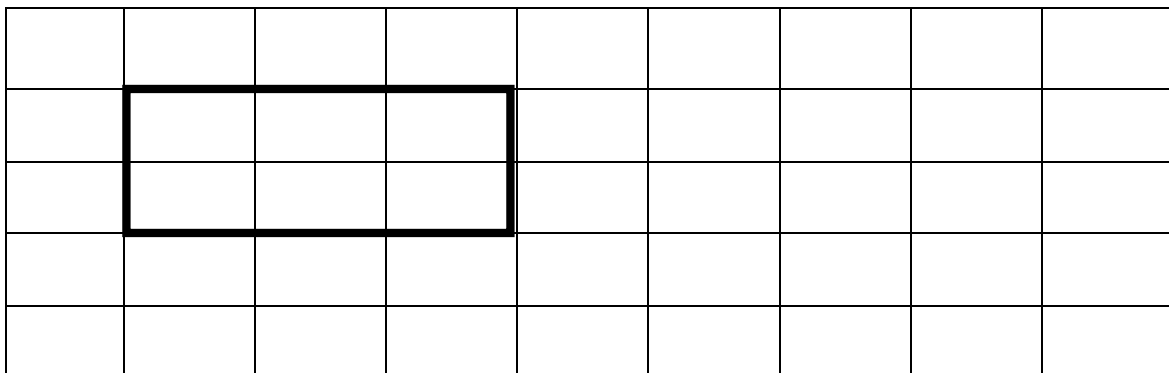
- C.    a. 8 inches                      b. 2 inches                      c. 16 inches                      d. 12 inches

2. Find the perimeter of the following polygon.



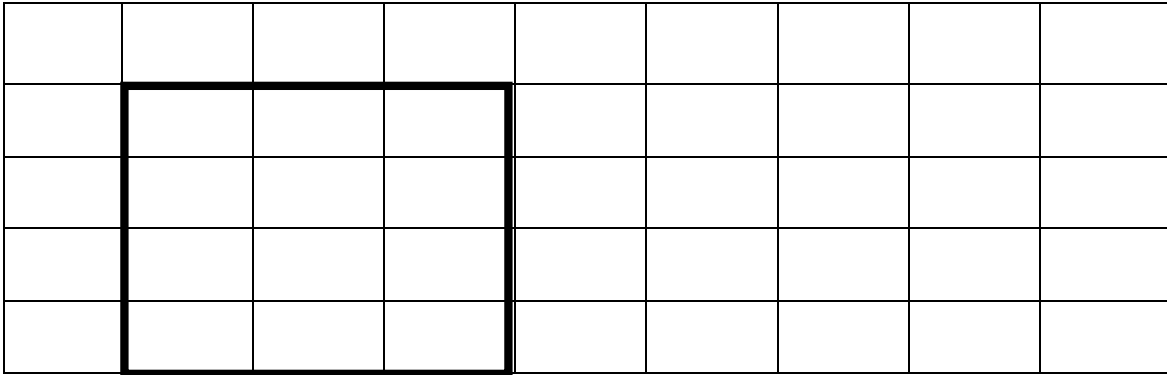
- B.    a. 17 inches                      b. 28 inches                      c. 24 inches                      d. 11 inches

3. Find the area of the following polygon.



- D    a. 10 square units                      b. 8 square units                      c. 9 square units                      d. 6 square units

4. Find the area of the following polygon.



- A.    a. 12 square units    b. 14 square unit    c. 10 square units    d. 15 square units



# What I KNOW about AREA!



I think area is....

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One question I have  
about area is...

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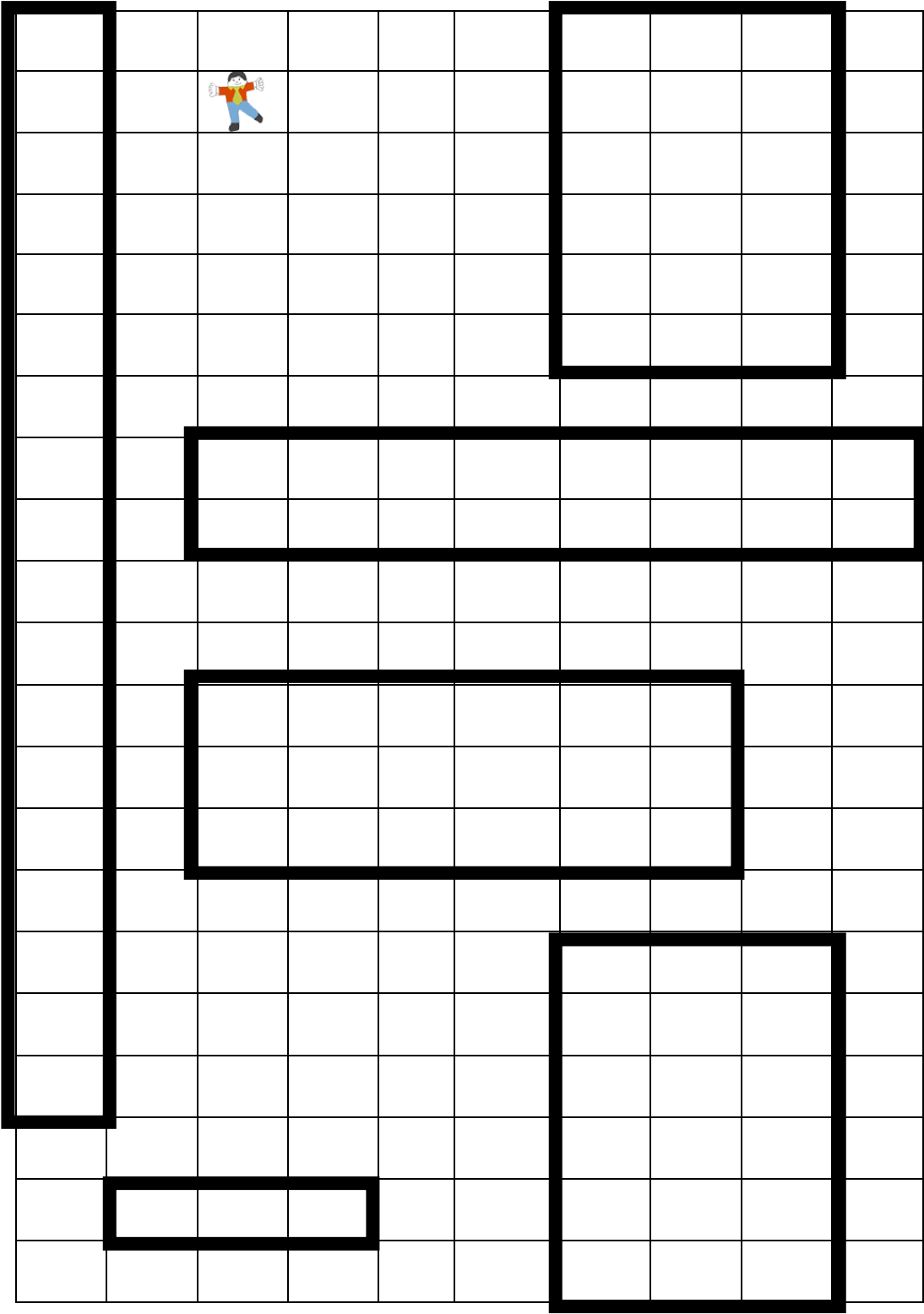
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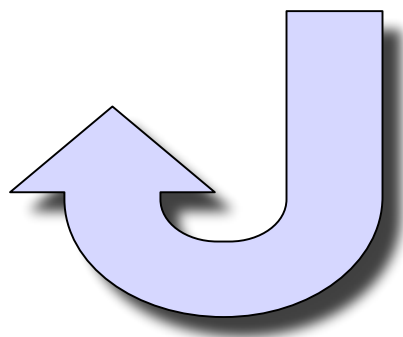
Here's a picture to show what I know about  
area:



“Matching Figures (Transparency)”







### “Measure Up”

Directions: Using your inch ruler, draw the measurements for each given amount.

9 in. by 4 in.

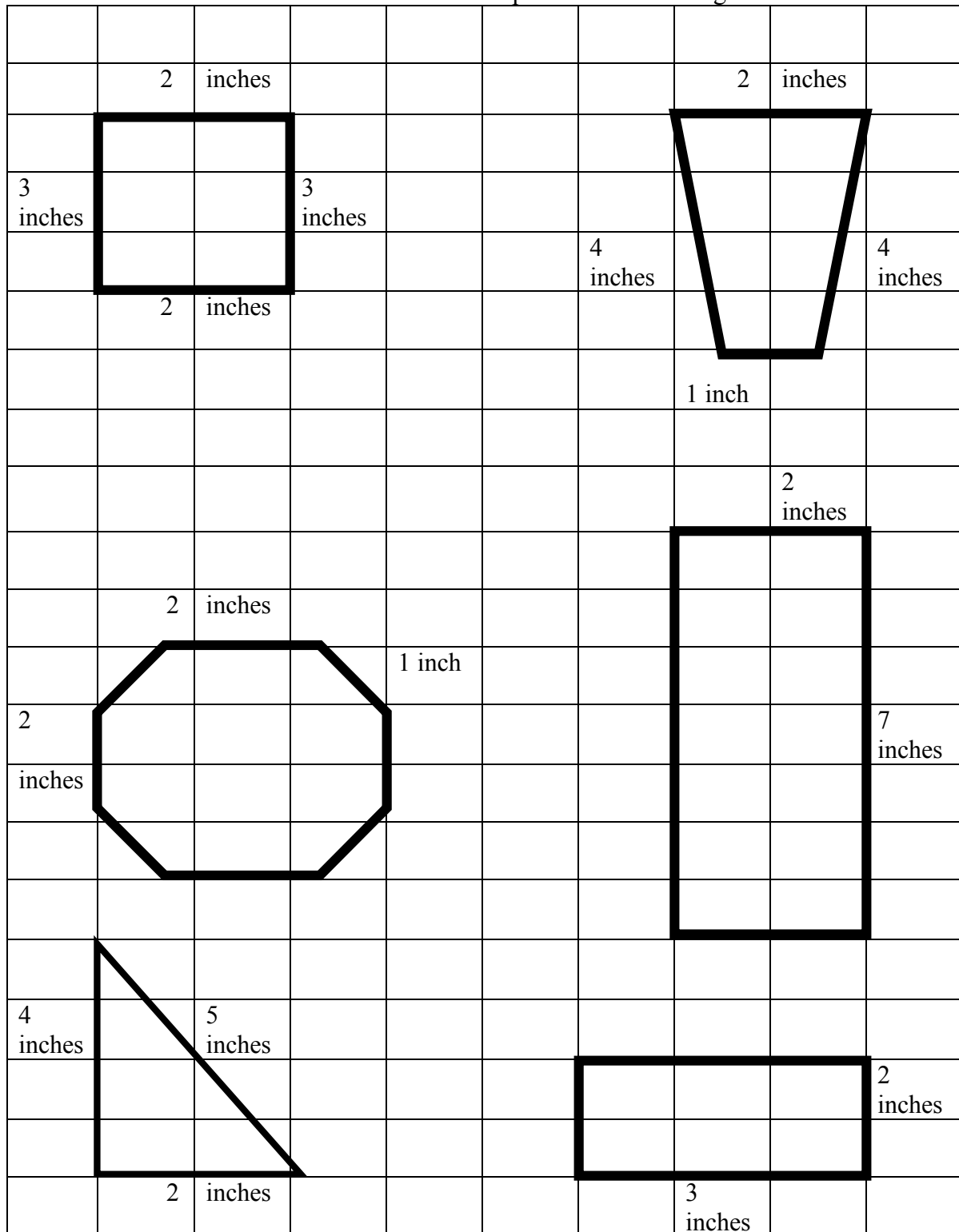
3 in. by 3 in.

8 in. by 6 in.

5 in. by 12 in.

[illegible]

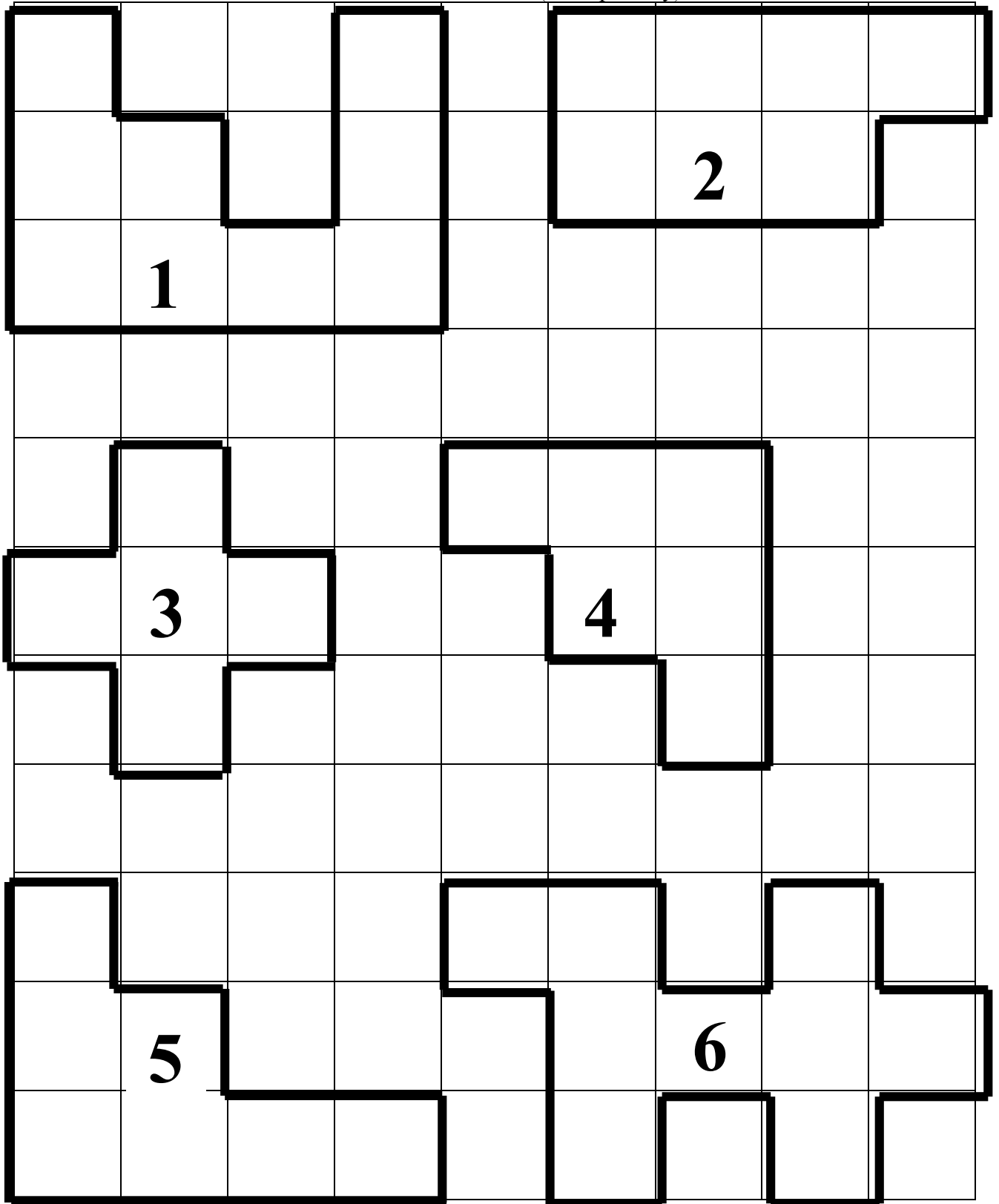
Calculate the perimeter of each figure.





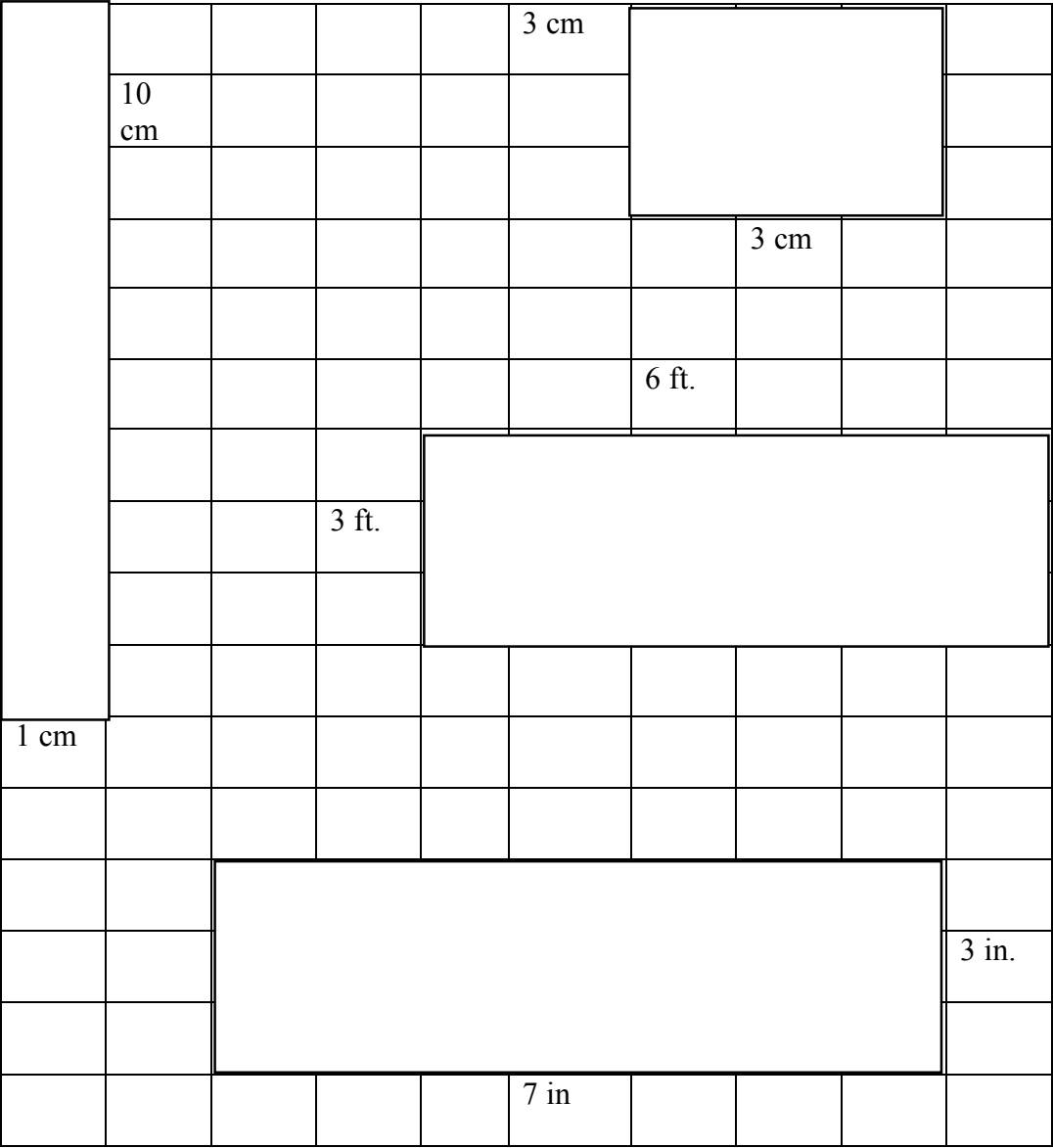
“Calculate the Area”

(Transparency)





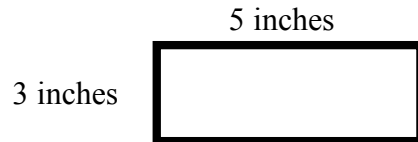
What is the area of each figure?  
Write your answers inside of the figure.





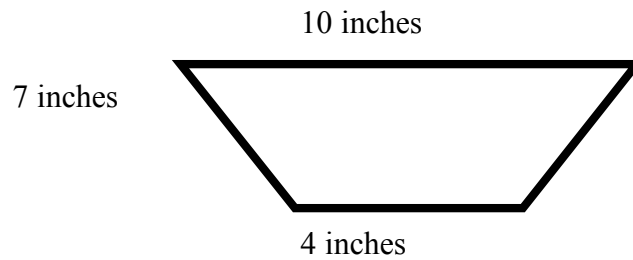
*Choose the correct response.*

1. Find the perimeter of the following polygons.



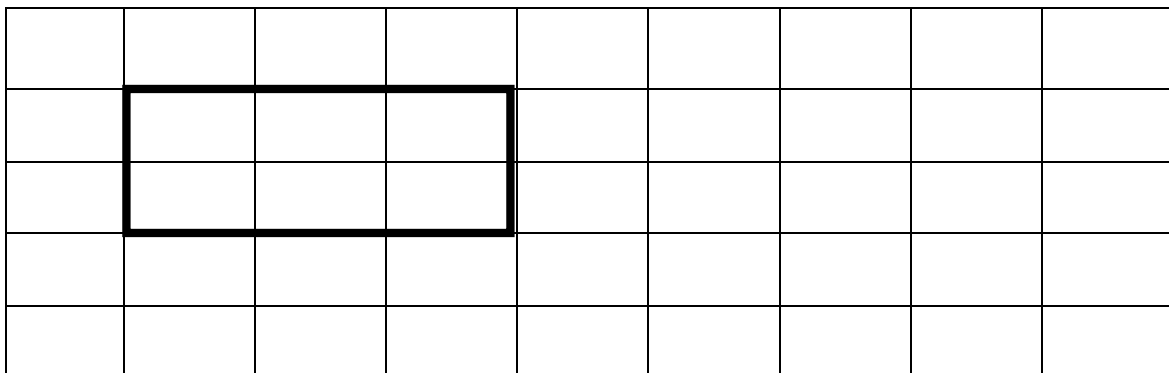
- a. 8 inches      b. 2 inches      c. 16 inches      d. 12 inches

2. Find the perimeter of the following polygon.



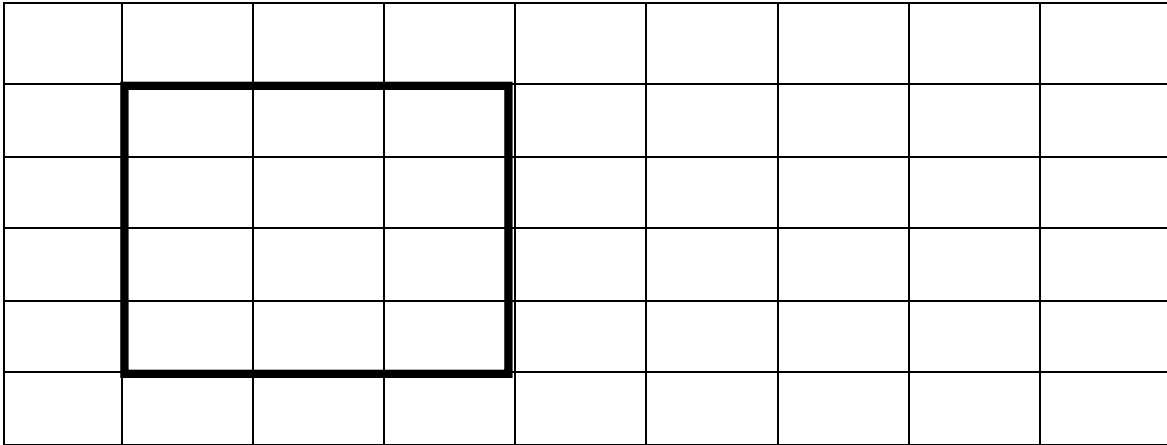
- a. 17 inches      b. 28 inches      c. 24 inches      d. 11 inches

3. Find the area of the following polygon.



- a. 10 square units      b. 8 square units      c. 9 square units      d. 6 square units

**4. Find the area of the following polygon.**



- a. 12 square units    b. 14 square units    c. 10 square units    d. 15 square units**





# What I KNOW about AREA!



I think area is....

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One question I have  
about area is...

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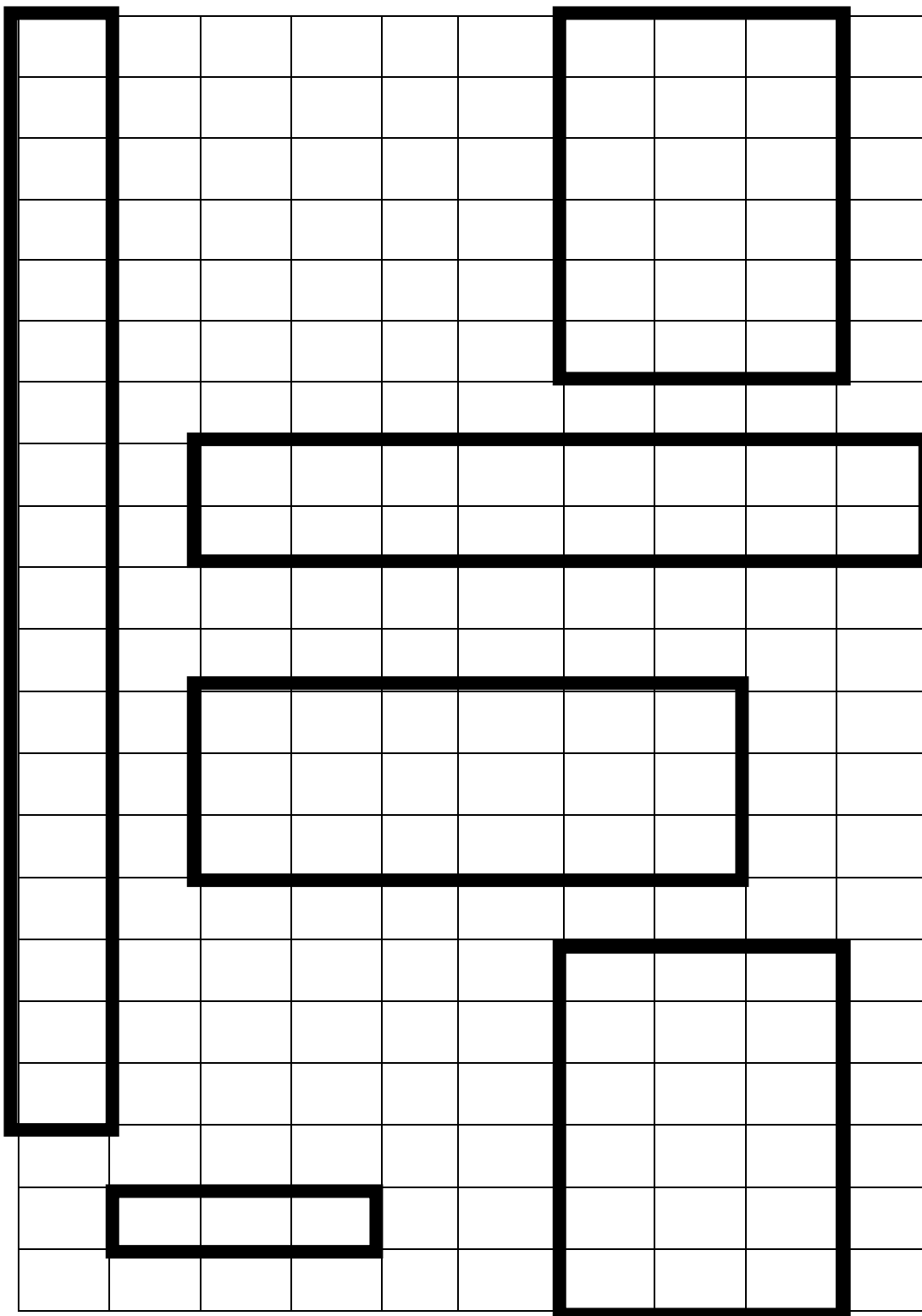


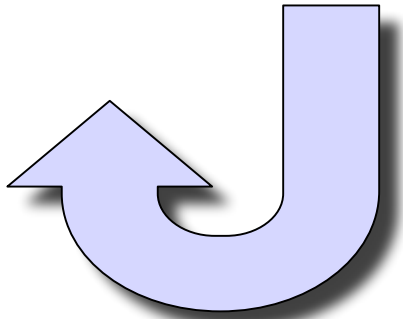
Here's a picture to show what I know about  
area:





# “Matching Figures”





“Measure Up”

Directions: Using your inch ruler, draw the measurements for each given amount.

9 in. by 4 in.

3 in. by 3 in.

8 in. by 6 in.

5 in. by 12 in.